REMARKS

Claims 1, 2, and 5-23 remain in the application. Claims 3 and 4 are cancelled. Claims 1, 10, and 16 are currently amended. Claims 5 and 6 are previously presented.

Applicants thank the Examiner for the detailed study of the application and prior. Applicant thanks the Examiner for the indication of allowable subject matter for the coupling of identifications of the selected ones of the clear channels to a modulated filter bank to derive a plurality of carrier frequencies corresponding to selected ones of the clear channels. In one aspect, the modulated filter bank contains an inverse fast Fourier transform circuit and a polyphase filter. Also, the Examiner indicated as allowable subject matter the prescribed communication bandwidth of 217 to 220 MHz band and a respective sub-bandwidth channel of 6.25 KHz.

The modulated filter bank in accordance with a non-limiting example of the claimed system and method is used to shape the spectrum of an OFDM modulator output and allows the processing of identifications of clear channels within the modulated filter bank to derive the carrier frequencies corresponding to selected ones of clear channels. Neither the cited U.S. Patent No. 6,304,756 to Hebeler et al. (hereinafter Hebeler) or U.S. Patent No. 4,578,815 to Persinotti either singularly or in combination discloses or suggests this modulated filter bank that can be used for processing identifications of clear channels to derive the carrier frequencies corresponding to selected ones of clear channels. Of course, the preferred aspect of the modulated filter bank is the illustrated Inverse Fast Fourier Transform (IFFT) unit

111 and the associated polyphase filter **112** to form the modulated filter bank **110** as shown in FIG. 2.

The independent Claims 1, 10, and 16 now recite the modulated filter bank for this claimed function as described. One skilled in the art would not be motivated from Hebeler and Persinotti to form the system and method as claimed for processing identifications within a modulated filter bank and deriving the carrier frequencies corresponding to selected ones of clear channels.

Applicants address in greater detail both Hebeler and Persinotti and why the claimed system and method as presented in this Amendment is novel and unobvious over Hebeler or Persinotti either singularly or in combination.

Hebeler scans for busy channels, but the scans are infrequent for the remote handset, most often when the handset goes on-hook. The base station can do the same or scan repeatedly since it has no battery-life issues. As a result, the interference information can be old. Interference data is therefore only occasionally available from both the handset and base station. At other times, only the base station's scanning information is available, so that interference visible only to the handset is not available for combining with the base station interference data ("the hidden node problem").

This could be reasonable for unlicensed portable telephones in close proximity in a household, but would not be acceptable in a wide-area network, especially for radios operating as secondary users in a licensed band. Hebeler also does not check for interference during an active call.

Therefore, if interference should arise during the call, Hebeler will not notice it until the call is terminated (seconds to hours) until the next scan is started. The motivation for Hebeler is mainly battery life rather than comprehensive interference avoidance as in the claimed system and method presented in this Amendment.

The system and method as claimed is directed to a cognitive radio and approaches the measurement and avoidance of interference, to and by the radio, in a more comprehensive manner. The radio provides a general data service for many applications, in unlicensed, licensed and secondary usage applications, rather than a single application like Hebeler in unlicensed bands. The technical problem to overcome is the possible interference and causing interference. This first goal is a requirement for secondary users in licensed bands. The frequency band is available for use by secondary users on a non-interfering bases only. The second goal provides the secondary user with better service.

Another aspect of the first goal concerns the "silent receiver problem." The claimed system and method minimizes its profile in the band so that unknown listeners will not be affected by the radio. Hebeler may notice another radio whenever the other radio transmits, but if the other radio is silent, Hebeler will be unaware (as would all radios). Hebeler does not, however, mitigate against affecting those "silent receivers." Again, this is not a problem for unlicensed portable telephones, but the silent receiver problem is an issue with frequency-hopping cognitive radios in bands shared with, for example, primary-licensed land-mobile radios whose squelch circuits, which would be constantly chattering if near a poorly designed cognitive radio. This issue could be

important enough to cast doubt on the viability of cognitive radios. Hebeler fails to meet this goal as well.

An additional goal is to provide the user with high bandwidth according to the conditions of the band. Hebeler provides one phone call and needs not provide high bandwidth for general applications, and therefore fails to meet this goal.

The claimed system and method carefully addresses the interference-avoidance goals by analyzing and adapting to the conditions of the band more completely than Hebeler. The claimed system and method constantly evaluates past and present interference information so that it will avoid interfering with others (and avoid being interfered with by others) and to harvest channels that were recently used but is not presently being used. Thus, the claimed system and method maximizes the usage of the band without increasing interference. The claimed system and method discovers the environment it is operating in and adapts to the environment to maximize utilization of the band. This typically cannot be a goal of Hebeler since the Hebeler phone system supports only one call regardless of the amount of interference or the number of channels available. The claimed system and method achieves these goals by: 1) using the entire set of clear channels in the band (such as through frequency-hopping), even if only a few are needed, 2) dwelling, for example, in a channel for only a short period of time (a few milliseconds), 3) constantly scanning the band to discover new interference, even during extended data transactions, including telephone calls, and 4) using multiple clear channels simultaneously to provide greater bandwidth.

Towards meeting these goals in one non-limiting aspect, the remotes and the base station in the claimed system and method scan all channels (up to 480 in the example of the 217-220 MHz band) several times per second, even during extended transmission periods. This measurement is done while the base station transmits a preamble because this is a known period during which no associated remote in the network is transmitting and typically will not be mistaken for interference. The base station can test for interference anytime it has not allowed a remote to transmit. Therefore, the base station has fresh, combined interference data from all sites several times per second under all conditions and can therefore mitigate against causing and suffering interference within this same time frame. The claimed system and method can combine and distribute this interference data in a responsive manner so that interference may be avoided in a real-time manner [see paragraphs 0020-0022, 0037]. Hebeler, on the other hand, teaches how to combine the data. Once a channel has been used, the claimed system and method will not use that channel, until it continuously remains unused for a period of time that is a parameter of the radio. Thus, interference is avoided, but reuse of formerly used but presently unused channels is enabled without unnecessary delay.

The silent receiver problem is mitigated by the claimed system and method by keeping fresh clear channel information for the whole band and in one non-limiting example frequency-hopping over the entire range of clear channels rather than dwelling on one or a few channels. The claimed system and method provides high bandwidth by using 'n' (up to 40 or more) clear channels at at a time, spreading the data over these channels, but hopping the 'n' channels over the whole range of

clear channels (up to 480 channels in the 217-220 MHz band) several times per second, thereby having low dwell time in the channels [see paragraph 0026]. Hebeler uses one or a pair of channels, remaining throughout the call, regardless of any changes in interference. Thus, radios in accordance with the claimed system and method do not energize the squelch circuits of silent receivers but provide high bandwidth to the users.

Hebeler's invention operates in an unlicensed band. While it could operate as a primary licensee in a licensed band, it could not operate as a secondary licensee (on a non-interfering basis) in a licensed band, because it would, as a result of its slow and incomplete scanning algorithm, interfere too often with the primary licensee.

With respect to Hebeler in view of Persinotti, applicants note that Persinotti has a trunking system in which "user" transmission channels are allocated on demand by the trunking system itself. Not stated but implied is that the trunking system's user channels are licensed or leased by the operators of the trunking system as the primary users, while the user transmission channels are managed by the trunking system. Thus, there is no expectation of interference to be avoided. Persinotti distributes its busy status of self-managed channels rather than "discovered" interference data. The channels scanned by Persinotti are for the control channels (col 4 lines 23-42), not user channels. Persinotti distributes this data over an out-of-band system (land line or separate microwave links). The scanning involves looking for a control channel with "suitably error free data signal" and remains there unless the signal degrades (col 3 lines 60-67). Persinotti has no general scanning for interference on user channels nor control channels. The claimed system and method,

by comparison, constantly distributes its interference data for user channels (and control channels) in-band [see paragraphs 0020-0022] and for the cognitive radio goals outlined above.

Hebeler chooses a subset of the available channels to scan for the purpose of increasing battery life by virtue of scanning fewer channels. The claimed system and method sequentially uses respectively different ones of selected ones of the clear channels. The claimed system and method does not randomly select a channel (or a pair of channels) and use them until the end of a significant transmission period (the length of a telephone call, for example). It sequentially uses all the available clear channels 'n' channels at a time, as described above. For example, if the radio is using 60 channels at a time (each burst) and there are 340 clear channels, the radio may use 60 of the 340 channels such as for a burst period (typically for a few milliseconds), spreading the data over those 60 channels, and then select a different subset of the 340 channels for the next burst [see paragraph 0026]. If any new interference began during the previous burst, a new clear channel list is created that excludes the new interfered-with channels. Thus the radio does not dwell for long in any available channel and does not cause interference for more than a burst (10s of milliseconds or less) [see paragraphs 0039-0040].

Hebeler, by comparison, parks on one or a pair of randomly selected channels from the clear channel list for the duration of the telephone call, regardless of new interference that might occur. This is not surprising in an unlicensed band, but Hebeler's method could not be used as a secondary user in a licensed band because of the potential for excessive

interference to a primary licensee. Thus, the claimed system and method provides a more generally applicable system and method. (It also provides more bandwidth by virtue of its multichannel bursts.)

As noted earlier, Persinotti has a trunking system in which "user" transmission channels are allocated on demand by the trunking system itself. Not stated but implied is that the trunking system's user channels are licensed or leased by the operators of the trunking system as the primary users. The user transmission channels would typically be managed by the trunking system. Thus, there is no expected interference. Persinotti's deallocation instruction set (which) is included in the message as part of the preamble is part of the management protocol for the demand-assigned allocation/deallocation of the voice channels. At the end of a transmission, the trunking system deallocates the resources. As part of that protocol, the deallocation message is sent via a data concentrator over a data modem (col 9, lines 10-20). There is no implication that the preamble starts this action, nor even that there is a preamble. (The words *preamble* and *burst* do not appear in Persinotti's application and there is no indication such terms are implied.) The channels scanned by Persinotti are for the control channels (col 4, lines 23-42), not user channels. Persinotti distributes this data over an out-of-band system (land line or separate microwave links). The scanning involves looking for a control channel with "suitably error free data signal" and remains there unless the signal degrades (col 3, lines 60-67).

In the claimed system and method, a preamble is the start of a burst transmission for burst-type transceivers. The preamble has a signature which the receiver uses to

differentiate a true burst from noise. The claimed system and method also uses the preamble itself as a signal for remotes to scan for interference (because that is a known period in which no related remote is transmitting) [see paragraph 0020-0022]. Further, as noted, Persinotti's deallocation signal is part of the demand-assigned protocol and does not appear to have any relationship to interference scanning.

Additionally, in the claimed system and method, a preamble is the start of a burst transmission for burst-type transceivers. The preamble has a signature which the receiver can use to differentiate a true burst from noise. The system also uses the preamble itself as a marker, among other things, for a potential entry point into the network via the join process [see paragraphs 0140, 0136, and 0020-0022].

It should be understood that Persinotti at col 4, lines 66-68 and col 5, lines 1-3 sets up a demand-assigned voice or data call using a pool of data channels and administrative messages over a separate pool of control channels. Persinotti distributes no interference information. Both the voice or data call frequencies and control frequencies are from a pool of frequencies known a priori. In Persinotti at col 5, 11-31, the voice/data trunking call resources are being deallocated. Again, this is not related to interference data.

Applicants contend that the present case is in condition for allowance and respectfully requests that the Examiner issue a Notice of Allowance and Issue Fee Due. If the

Examiner has any questions or suggestions for placing this case in condition for allowance, the undersigned attorney would appreciate a telephone call.

Respectfully submitted,

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